UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/723,554	11/26/2003	Russell Gaudiana	15626-006001 / KON-018	9727

26161 7590 10/18/2007

FISH & RICHARDSON PC
P.O. BOX 1022
MINNEAPOLIS, MN 55440-1022

EXAMINER	
TRINH, THANH TRUC	

ART UNIT	PAPER NUMBER
1795	

MAIL DATE	DELIVERY MODE
10/18/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	**Application No.** 10/723,554	**Applicant(s)** GAUDIANA ET AL.	
	Examiner Thanh-Truc Trinh	**Art Unit** 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 July 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12 and 14-52* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12 and 14-52* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date 7/12/2007 ; 7/31/2007
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. Claim 48 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 48 recites limitation “at least some of the plurality of photovoltaic cells being wherein at least some of the electrically connected photovoltaic cells are electrically connected”. The claimed language is too confusing as to which is electrically connected, “some of the plurality of photovoltaic cells” or “some of the electrically connected photovoltaic cells”. Appropriate correction is required.

Claim 48 is recites “the electrically connected photovoltaic cells” in line 2 and 3 lacks antecedent basis.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

1. Claims 1-8, 11, 14, 17, 19, 21 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meissner et al. (US Patent 6559375) in view of Nakamura (US Patent 6291763).

As seen in Figure 3, Meissner et al. disclose a photovoltaic cell comprising a first electrode (20); a second electrode (70); and a photoactive layer (including layers 40 and 50) between the first and second electrodes and comprising an electron acceptor material comprising a fullerene (See col. 5 line 60-62), and an electron donor material comprising a polymer (MPP – See col. 5 lines 42-65).

Meissner et al. do not teach using mesh electrodes.

With respect to claim 1, Nakamura teaches using mesh electrode (9) in Figures 2B-D. (See col. 29 lines 49-67)

With respect to claim 2, Nakamura teaches the mesh electrode is a cathode. (See Figures 2C-D)

With respect to claim 3, Nakamura teaches the mesh electrode is anode. (See Figures 2B and 2D)

With respect to claims 4-8 and 11, Nakamura teaches the mesh electrode (9) comprising metal leads (See col. 29 line 50), therefore it comprises wires made of electrically conductive material. It is the Examiner's position that Nakamura's metallic mesh electrode (9) also meets the requirement of the instant "expanded mesh" because the "expanded" does not impart a distinguishable physical limitation. For example, the metal material, the thickness, the opening size of the mesh, etc., of the instant expanded metallic mesh electrode can be the same as in Nakamura regardless of whether or not Nakamura's metallic mesh electrode has been subjected to a product-by-process expanding step. In other words, any metallic mesh electrode is essentially the same as the instant expanded metallic mesh electrode in the absence of a recitation of a distinguishing feature.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the solar cell of Meissner et al. by including mesh electrodes as taught by Nakamura in place of the first or second electrodes, because it would decrease the resistance of the transparent conductive substrate. (See col. 29 lines 49-68 and col. 6 lines 22-23).

With respect to claim 14, Meisner et al. teach the electron acceptor material comprises a substituted fullerene. (See col. 3 lines 3-19 and claim 16).

With respect to claims 17 and 19, Meissner et al. teach layer (30) is between the first electrode (20) and photoactive layer (including layers 40 and 50), wherein layer 30 is n-conductive (See col. 42-47 or col. 6 lines 44-52). It is the Examiner's position that the layer 30 is a hole blocking layer, since it is an n-conductive and only conducts

electrons. Further, in the combination of Meissner et al. and Nakamura, the hole blocking layer (30) is obviously between the photoactive layer and the mesh electrode.

With respect to claim 21, Meissner et al. teach layer (60) having a p-conductivity (See col. 6 lines 54-60). It is the Examiner's position that a p-conductivity layer is a hole carrier layer. In the combination of Meissner et al. and Nakamura, layer (60) (or instant hole carrier layer) is obviously between the photoactive layer (including layers 40 and 50) and the mesh electrode.

With respect to claim 25, Nakamura teaches including mesh electrodes (or metal mesh 9) in both electrodes. (See Figure 2D). Therefore the first electrode must comprise a mesh electrode.

2. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meissner et al. (US Patent 6559375) in view of Nakamura (US Patent 6291763) in further in view of Griffin et al. (US Patent 3442007).

Meissner et al. and Nakamura teach a photovoltaic cell as described in claim 6.

Neither Meissner et al. nor Nakamura teaches the wires mesh electrode comprises a coating including an electrically conductive material.

Griffin et al. teach using mesh wire comprising a coating including an electrically conductive material such as gold, copper or nickel. (See col. 2 lines 63-72).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the photovoltaic cells of Meissner and Nakamura by

using coated wires as taught by Griffin et al., because it would provide an effective adhesion and a good power efficiency. (See col. 2 lines 62 to col. 3 line 4).

3. Claims 1 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meissner et al. (US Patent 6559375) in view of Scher et al. (US Patent 6878871).

As seen in Figure 3, Meissner et al. disclose a photovoltaic cell comprising a first electrode (20); a second electrode (70); and a photoactive layer (including layers 40 and 50) between the first and second electrodes and comprising an electron acceptor material comprising a fullerene (See col. 5 line 60-62), and an electron donor material comprising a polymer (MPP – See col. 5 lines 42-65).

Meissner et al. do not teach using woven mesh electrode.

Scher et al. teach using overlapping arrays of wires, or woven mesh electrodes. (See col. 31 lines 20-36 or col. 32 lines 27-57)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the photovoltaic cell of Meissner et al. by including woven mesh electrodes as taught by Scher et al., because it would give an alternative architecture of the electrode (See col. 30 lines 63 to col. 31 lines 36) and provide a more efficient electrode. (See col. 32 lines 36-38).

4. Claims 1 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meissner et al. (US Patent 6559375) in view of Nakamura (US Patent 6291763).

As seen in Figure 3, Meissner et al. disclose a photovoltaic cell comprising a first electrode (70); a second electrode (20); a photoactive layer (including layers 40 and 50) between the first and second electrodes and comprising an electron acceptor material comprising a fullerene (See col. 5 line 60-62), and an electron donor material comprising a polymer (MPP – See col. 5 lines 42-65).

Meissner et al. do not teach using mesh electrodes.

With respect to claim 1, Nakamura teaches using mesh electrode (9) in Figures 2B-D. (See col. 29 lines 49-67)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the solar cell of Meissner et al. by including a mesh electrode as taught by Nakamura in place of the second electrode, because it would decrease the resistance of the transparent conductive substrate. (See col. 29 lines 49-68 and col. 6 lines 22-23).

With respect to claim 23, Meissner et al. teach layer 60 having a p-conductivity (See col. 6 lines 54-60). It is the Examiner's position that a p-conductivity layer is a hole carrier layer. In the combination of Meissner et al. and Nakamura, layer 60 (or instant hole carrier layer) is obviously between the photoactive layer (including layers 40 and 50) and the first electrode (70).

5. Claims 26-28, 32-37, 39-40, 42-44 and 48-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meissner et al. (US Paten 6559375) in view of Nakamura (US Patent 6291763).

As seen in Figure 3, Meissner et al. disclose a photovoltaic cell comprising a first electrode (20); a second electrode (70); and a photoactive layer (including layers 40 and 50) between the first and second electrodes and comprising an electron acceptor material comprising a fullerene (See col. 5 line 60-62), and an electron donor material comprising a polymer (MPP – See col. 5 lines 42-65); a hole blocking layer (30) between the first electrode (20) and photoactive layer (40 and 50); a hole carrier (60) between the second electrode (70) and the photoactive layer (40 and 50).

Meissner et al. do not teach using mesh electrodes.

With respect to claim 26, Nakamura teaches using mesh electrode (9) in Figures 2B-D. (See col. 29 lines 49-67)

With respect to claims 27-28 and 32-37 and 39, Nakamura teaches the mesh electrode (9) comprising metal leads (See col. 29 line 50), therefore it comprises wires made of electrically conductive material. It is the Examiner's position that Nakamura's metallic mesh electrode (9) also meets the requirement of the instant "expanded mesh" because the "expanded" does not impart a distinguishable physical limitation. For example, the metal material, the thickness, the opening size of the mesh, etc., of the instant expanded metallic mesh electrode can be the same as in Nakamura regardless of whether or not Nakamura's metallic mesh electrode has been subjected to a product-by-process expanding step. In other words, any metallic mesh electrode is essentially the same as the instant expanded metallic mesh electrode in the absence of a recitation of a distinguishing feature.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the solar cell of Meissner et al. by including mesh electrodes as taught by Nakamura in place of the first or second electrodes, because it would decrease the resistance of the transparent conductive substrate. (See col. 29 lines 49-68 and col. 6 lines 22-23).

With respect to claims 40 and 42, Meissner et al. teach substrate 10 supporting the electrode (20) as seen in Figure 3. Nakamura also teaches the support layers (13) supporting mesh electrodes (9) as seen in Figure 2D. In such combination of Meissner et al. and Nakamura, the hole carrier layer (60) is obviously in contact with the substrate through the openings of the mesh electrode.

With respect to claims 43-44 and 48-49, Nakamura describes a module of solar cells, wherein the solar cells being connected to each other with a metal lead, flexible wiring. (See col. 30 lines 24-57). Therefore, it would have been obvious to have a photovoltaic system (or module) comprising a plurality of photovoltaic cells, either as described in claim 40 or 26, wherein at least some or all of the plurality of photovoltaic cells are electrically connected to increase the power output. (See col. 31 lines 63-65)

6. Claims 26 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meissner et al. (US Patent 6559375) in view of Scher et al. (US Patent 6878871).

As seen in Figure 3, Meissner et al. disclose a photovoltaic cell comprising a first electrode (20); a second electrode (70); and a photoactive layer (including layers 40 and 50) between the first and second electrodes and comprising an electron acceptor

material comprising a fullerene (See col. 5 line 60-62), and an electron donor material comprising a polymer (MPP – See col. 5 lines 42-65); a hole blocking layer (30) between the first electrode (20) and photoactive layer (40 and 50); a hole carrier (60) between the second electrode (70) and the photoactive layer (40 and 50).

Meissner et al. do not teach using woven mesh electrode.

Scher et al. teach using overlapping arrays of wires, or woven mesh electrode. (See col. 31 lines 20-36 or col. 32 lines 27-57)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the photovoltaic cell of Meissner et al. by including woven mesh electrodes as taught by Scher et al., because it would give an alternative architecture of the electrode (See col. 30 lines 63 to col. 31 lines 36) and provide a more efficient electrode. (See col. 32 lines 36-38).

7. Claims 45-47 and 50-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meissner et al. (US Patent 6559375) in view of Nakamura (US Patent 6291763) and further in view of Chaplin et al. (US Patent 2780765).

Meissner et al. and Nakamura teach a photovoltaic system as described in claims 43 and 48.

Neither Meisnner et al. nor Nakamura teaches connecting the photovoltaic cells in series or in parallel.

Chapin et al. teach connecting the photovoltaic cells in series and parallel. (See col. 4 lines 45-74).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to connect the photovoltaic cells of Meissner et al. and Nakamura in either series or parallel as taught by Chapin et al., because it would give a large voltage if a plurality of photovoltaic cells connecting in series, and a large current if connecting in parallel. (See col. 4 lines 48-50 of Chapin et al.).

It would certainly have been obvious to one having ordinary skill in the art at the time the invention was made to connect the photovoltaic system parallel to the load, because it would give a large input current to the load.

8. Claims 1-8, 11, 14-16, 21, 22, 24-25 and 43-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chirvase et al. (Journal of Applied Physics, Vol. 93, No. 6, 15 March 2003, pages 3376-3383) in view of Nakamura (US Patent 6291763)

Chirvase et al. describe an ITO/PEDOT:PSS/P3HT:PCBM/Al photovoltaic cell (See page 3378, third paragraph of first column) comprising a first electrode (Al); a second electrode (ITO); a photoactive layer (P3HT:PCBM) between the first and second electrode, wherein the photoactive layer comprises an electron acceptor material comprising a fullerene (PCBM – See page 3376, second paragraph of "Introduction") and an electron donor material comprising a polymer (P3HT – See page 3376, second paragraph of "Introduction").

Chirvase et al. do not teach using mesh electrodes.

With respect to claim 1, Nakamura teaches using mesh electrode (9) in Figures 2B-D. (See col. 29 lines 49-67)

With respect to claim 2, Nakamura teaches the mesh electrode is a cathode. (See Figures 2C-D)

With respect to claim 3, Nakamura teaches the mesh electrode is anode. (See Figures 2B and 2D)

With respect to claims 4-8 and 11, Nakamura teaches the mesh electrode (9) comprising metal leads (See col. 29 line 50), therefore it comprises wires made of electrically conductive material. It is the Examiner's position that Nakamura's metallic mesh electrode (9) also meets the requirement of the instant "expanded mesh" because the "expanded" does not impart a distinguishable physical limitation. For example, the metal material, the thickness, the opening size of the mesh, etc., of the instant expanded metallic mesh electrode can be the same as in Nakamura regardless of whether or not Nakamura's metallic mesh electrode has been subjected to a product-by-process expanding step. In other words, any metallic mesh electrode is essentially the same as the instant expanded metallic mesh electrode in the absence of a recitation of a distinguishing feature.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the solar cell of Chirvase et al. by including mesh electrodes as taught by Nakamura in place of the first or second electrodes, because it would decrease the resistance of the transparent conductive substrate. (See col. 29 lines 49-68 and col. 6 lines 22-23).

With respect to claim 14, Chirvase et al. teach the electron acceptor material comprises a substituted fullerene. (See page 3376, 2nd paragraph of Introduction).

With respect to claims 15-16, Chirvase et al. teach the polymer is poly(3-hexylthiophene). (See page 3376, 2nd paragraph of Introduction)

With respect to claim 21, Chirvase et al. teach layer (PEDOT:PSS) having a p-conductivity (See page 3378, first column, 3rd paragraph). It is the Examiner's position that a p-conductivity layer is a hole carrier layer. In the combination of Chirvase et al. and Nakamura, layer (PEDOT:PSS) is obviously between the photoactive layer (including layers 40 and 50) and the mesh electrode.

With respect to claims 22 and 24, Chirvase et al. teach the polymer is poly(3-hexylthiophene). (See page 3376, 2nd paragraph of Introduction)

With respect to claim 25, Nakamura teaches including mesh electrodes (or metal mesh 9) in both electrodes. (See Figure 2D). Therefore the first electrode must comprise a mesh electrode.

With respect to claims 43-44, Nakamura describes a module of solar cells, wherein the solar cells being connected to each other with a metal lead, flexible wiring. (See col. 30 lines 24-57). Therefore, it would have been obvious to have a photovoltaic system (or module) comprising a plurality of photovoltaic cells, either as described in claim 40 or 26, wherein at least some or all of the plurality of photovoltaic cells are electrically connected to increase the power output. (See col. 31 lines 63-65)

9. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chirvase et al. (Journal of Applied Physics, Vol. 93, No. 6, 15 March 2003, pages 3376-

3383) in view of Nakamura (US Patent 6291763) in further in view of Griffin et al. (US Patent 3442007).

Chirvase et al. and Nakamura teach a photovoltaic cell as described in claim 6.

Neither Chirvase et al. nor Nakamura teaches the wires mesh electrode comprises a coating including an electrically conductive material.

Griffin et al. teach using mesh wire comprising a coating including an electrically conductive material such as gold, copper or nickel. (See col. 2 lines 63-72).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the photovoltaic cells of Chirvase et al. and Nakamura by using coated wires as taught by Griffin et al., because it would provide an effective adhesion and a good power efficiency. (See col. 2 lines 62 to col. 3 line 4).

10. Claims 1, 12 and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chirvase et al. (Journal of Applied Physics, Vol. 93, No. 6, 15 March 2003, pages 3376-3383) in view of Scher et al. (US Patent 6878871).

Chirvase et al. describe an ITO/PEDOT:PSS/P3HT:PCBM/Al photovoltaic cell (See page 3378, third paragraph of first column) comprising a first electrode (Al); a second electrode (ITO); a photoactive layer (P3HT:PCBM) between the first and second electrode, wherein the photoactive layer comprises an electron acceptor material comprising a fullerene (PCBM – See page 3376, second paragraph of "Introduction") and an electron donor material comprising a polymer (P3HT – See page 3376, second paragraph of "Introduction").

Chirvase et al. do not teach a mesh electrode, nor do they teach a hole blocking layer comprising a material selected from the group consisting of LiF, metal oxides and combinations thereof.

With respect to claims 1 and 12, Scher et al. teach using woven mesh electrodes. (See col. 31 lines 20-36 or col. 32 lines 27-57)

With respect to claims 17-18, Scher et al. teach a hole blocking layer deposited between a photoactive layer and an electrode that conducts electrons to function as an electrical check valve that permits electron conduction and blocks hole conduction, wherein the hole blocking layer comprises metal oxide such as TiO_2. (See col. 22 lines 1-43).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the photovoltaic cell of Chirvase et al. by including woven mesh electrodes as taught by Scher et al., because it would give an alternative architecture of the electrode (See col. 30 lines 63 to col. 31 lines 36) and provide a more efficient electrode. (See col. 32 lines 36-38).

It would certainly have been obvious to one skilled in the art to modify the photovoltaic cell of Chirvase et al. by providing a hole blocking layer as taught by Scher et al. between the photoactive layer (P3HT:PCBM) and the first electrode (Al), because it would provide an electrical check valve that permits electron conduction and blocks hole conduction. (See col. 22 lines 1-43).

11. Claims 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chirvase et al. (Journal of Applied Physics, Vol. 93, No. 6, 15 March 2003, pages 3376-3383) in view of Nakamura (US Patent 6291763) and further in view of Scher et al. (US Patent 6878871).

Chirvase et al. and Nakamura teach a photovoltaic as described in claim 1 of section 9. Nakamura also teaches the mesh electrode can be either cathode or anode. (See Figures 2B-D).

Neither Chirvase et al. nor Nakamura teaches a hole blocking layer between the photoactive layer and the mesh electrode.

Scher et al. teach a hole blocking layer between the photoactive layer and the electrode that conducts electrons, wherein the hole blocking layer comprises TiO2, a metal oxide. (See col. 22 lines 1-43).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the photovoltaic cell of Chirvase et al. and Nakamura by providing a hole blocking layer as taught by Scher et al, because it would function as an electrical check valve that permits electron conduction and block hole conduction. (See col. 22 lines 1-43). In such combination, the hole blocking layer is obviously between the photoactive layer and the mesh electrode, since Nakamura teaches either electrode can be a mesh electrode, or both electrodes are mesh electrodes. (See Figures 2B-D of Nakamura)

12. Claims 1 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chirvase et al. (Journal of Applied Physics, Vol. 93, No. 6, 15 March 2003, pages 3376-3383) in view of Nakamura (US Patent 6291763).

Chirvase et al. describe an ITO/PEDOT:PSS/P3HT:PCBM/Al photovoltaic cell (See page 3378, third paragraph of first column) comprising a first electrode (ITO); a second electrode (Al); a photoactive layer (P3HT:PCBM) between the first and second electrode, wherein the photoactive layer comprises an electron acceptor material comprising a fullerene (PCBM – See page 3376, second paragraph of "Introduction") and an electron donor material comprising a polymer (P3HT – See page 3376, second paragraph of "Introduction").

Chirvase et al. do not teach using mesh electrodes.

With respect to claim 1, Nakamura teaches using mesh electrode (9) in Figures 2B-D. (See col. 29 lines 49-67)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the solar cell of Chirvase et al. by including a mesh electrode as taught by Nakamura in place of the second electrode, because it would decrease the resistance of the transparent conductive substrate. (See col. 29 lines 49-68 and col. 6 lines 22-23).

With respect to claim 23, Chirvase et al. teach layer (PEDOT:PSS) having a p-conductivity (See page 3378, 3rd paragraph of the first column). It is the Examiner's position that a p-conductivity layer is a hole carrier layer. In the combination of Chirvase

et al. and Nakamura, layer PEDOT:PSS (or instant hole carrier layer) is obviously between the photoactive layer (P3HT:PCBM) and the first electrode (ITO).

13. Claims 26-29, 30-37, 39-42 and 48-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chirvase et al. (Journal of Applied Physics, Vol. 93, No. 6, 15 March 2003, pages 3376-3383) in view of Scher et al. (US Patent 6878871).

With respect to claims 26 and 29, Chirvase et al. describe an ITO/PEDOT:PSS/P3HT:PCBM/Al photovoltaic cell (See page 3378, third paragraph of first column) comprising a first electrode (Al); a second electrode (ITO); a photoactive layer (P3HT:PCBM) between the first and second electrode, wherein the photoactive layer comprises an electron acceptor material comprising a fullerene (PCBM – See page 3376, second paragraph of "Introduction") and an electron donor material comprising a polymer (P3HT – See page 3376, second paragraph of "Introduction"); a hole carrier (PEDOT:PSS) between the photoactive layer (P3HT:PCBM) and the second electrode (ITO), wherein the hole carrier comprises polyethylene-dioxythiophene, or a type of polythiophene.

Chirvase et al. do not teach a mesh electrode, a hole blocking layer between the first electrode and photoactive layer.

Scher et al. teach a mesh electrode (706 – See col. 31 lines 20-36 or col. 32 lines 27-58), and a hole blocking layer between the photoactive layer and the electrode conducting electrons (or instant first electrode Al). (See col. 22 lines 1-43)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the solar cell of Chirvase et al. by replacing the second electrode with a mesh electrodes and including a hole blocking layer as taught by Scher et al., because the mesh electrode would provide a more efficient electrode (See col. 2 lines 36-38) and the hole blocking layer would function as an electrical check valve that permits electron conduction and block hole conduction. (See col. 22 lines 1-43)

With respect to claims 27-28, Scher et al. teach the mesh comprises an electrically conductive material such as metal, conductive polymer or combination thereof. (See col. 32 lines 27-58).

With respect to claims 30-31, Scher et al. teach the hole blocking layer comprises TiO_2, a metal oxide. (See col. 22 lines 1-43)

With respect to claims 32-37 and 39, Scher et al. teach the mesh electrode can be wires of metal (an electrically conductive material), wires coated with an electrically conductive material such as blocking layers, or woven mesh (or overlapping arrays of wires). (See col. 31 lines 20-36 and col. 32 lines 54-57). In addition, it is the Examiner's position that metallic screen mesh electrode of Scher et al. meets the requirement of the instant "expanded mesh" because the "expanded" does not impart a distinguishable physical limitation. For example, the metal material, the thickness, the opening size of the mesh, etc., of the instant expanded metallic mesh electrode can be the same as in Scher et al. regardless of whether or not Scher et al. 's metallic screen mesh electrode has been subjected to a product-by-process expanding step. In other words, any

metallic screen mesh electrode is essentially the same as the instant expanded metallic mesh electrode in the absence of a recitation of a distinguishing feature.

With respect to claims 40 and 42, as seen in Figure 7, Scher et al. teach a substrate (710) supporting the mesh electrode (706). In the combination of Chirvase et al. and Scher et al., the hole carrier is obviously in contact with the substrate through the opening of the mesh.

With respect to claim 41, Scher et al. teach forming sealing layer (or instant substrate) over electrode layer using adhesive sealing method. Therefore it would have been obvious to have an adhesive layer adhering the substrate to the electrode. In other words, the adhesive layer is between the substrate and the hole carrier layer, since the hole carrier is next to the electrode.

With respect to claim 48-49, Scher et al. describe the photovoltaic cells can be connected to each other electrically. (See col. 4 lines 25-48). It would have been obvious to connected the photovoltaic cells together in order to have greater output.

With respect to claim 52, Scher et al. teach a load is connected to the photovoltaic cell as seen in Figures 10, 11 or 12. It would have been obvious to connect the photovoltaic cell to a load in order to complete the circuit and make use of the power output from the photovoltaic cells.

14. Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chirvase et al. (Journal of Applied Physics, Vol. 93, No. 6, 15 March 2003, pages 3376-3383) in

view of Scher et al. (US Patent 6878871) and further in view of Nakamura (US Patent 6291763)

Chirvase et al. and Scher et al. teach a photovoltaic cell having a first electrode, a mesh electrode, a hole blocking layer, a hole carrier layer and a photoactive layer as described in claim 26.

Neither Chirvase et al. nor Scher et al. teach the first electrode comprises a mesh electrode.

Nakamura teaches both electrodes are mesh electrodes, or the first electrode is also a mesh electrode. (See Figure 2D).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the photovoltaic cell of Chirvase et al. and Scher et al. by having both electrodes as mesh electrodes as taught by Nakamura, because it would reduce the resistance of the transparent conductive substrate. (See col. 29 lines 49-68 and col. 6 lines 22-23).

15. Claims 45-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chirvase et al. (Journal of Applied Physics, Vol. 93, No. 6, 15 March 2003, pages 3376-3383) in view of Nakamura (US Patent 6291763) and further in view of Chaplin et al. (US Patent 2780765).

Chirvase et al. and Nakamura teach a photovoltaic system as described in claim 43.

Neither Chirvase et al. nor Nakamura teaches connecting photovoltaic cells in series, in parallel or to a load.

Chapin et al. teach connecting the photovoltaic cells in series and parallel. (See col. 4 lines 45-74).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to connect the photovoltaic cells of Meissner et al. and Nakamura in either series or parallel as taught by Chapin et al., because it would give a large voltage if a plurality of photovoltaic cells connecting in series, and a large current if connecting in parallel. (See col. 4 lines 48-50 of Chapin et al.).

It would certainly have been obvious to one having ordinary skill in the art at the time the invention was made to connect the photovoltaic system parallel to the load, because it would give a large input current to the load.

16. Claims 50-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chirvase et al. (Journal of Applied Physics, Vol. 93, No. 6, 15 March 2003, pages 3376-3383) in view of Scher et al. (US Patent 6878871) and further in view of Chaplin et al. (US Patent 2780765).

Chirvase et al. and Scher et al. teach a photovoltaic system as described in claim 48.

Neither Chirvase et al. nor Scher et al. teach connecting the photovoltaic cells in series or in parallel.

Chapin et al. teach connecting the photovoltaic cells in series and parallel. (See col. 4 lines 45-74).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to connect the photovoltaic cells of Chirvase et al. and Scher et al. in either series or parallel as taught by Chapin et al., because it would give a large voltage if a plurality of photovoltaic cells connecting in series, and a large current if connecting in parallel. (See col. 4 lines 48-50 of Chapin et al.).

It would certainly have been obvious to one having ordinary skill in the art at the time the invention was made to connect the photovoltaic system parallel to the load, because it would give a large input current to the load.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

17. Claims 1-12 and 14-52 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-39 of copending Application No. 11/033217 in view of Scher et al. (US Patent 6878871). The subject matters of the claims of copending Application No. 11/033217 are substantially the same as that of the instant claims, except for the manner in which the electrodes are in the shape of a mesh, a hole blocking layer, a hole carrier layer. It would have been obvious to one having ordinary skill in the art to modify the cell of claims 1-39 of copending Application No. 11/033217 by utilizing the materials as taught Scher et al., because it would provide a desired overall device property. (See col. 4 lines 56-58).

This is a provisional obviousness-type double patenting rejection.

Response to Arguments

Applicant's arguments with respect to claims 1-12 and 14-52 have been considered but are moot in view of the new ground(s) of rejection.

Applicant argues Nakamura does not disclose or suggest a photoactive layer that includes an electron acceptor material and an electron donor material, wherein the electron acceptor material includes a fullerene and the electron donor material includes a polymer. Applicant also argues Nakamura and Meissner et al. disclose very different types of photovoltaic cells that contain very different materials in their photoactive layers. The Examiner respectfully disagrees. As seen in the rejection above, Meissner

et al. disclose fullerene as an electron acceptor and a polymer as an electron donor material; Nakamura teaches using mesh electrodes. Although Meissner et al. and Nakamura teach different type of solar cell, but the mesh electrodes of Nakamura is applicable to any kind of solar cell. Therefore the combination of Meissner et al. and Nakamura as an obvious type of rejection is proper.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh-Truc Trinh whose telephone number is 571-272-6594. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TT

10/09/2007

Nam Nguyen

NAM NGUYEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700